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THE RELATIONSHIP BETWEEN CLASSROOM ARRANGEMENT AND PERFORMANCE OF CHILDREN IN SCIENCE IN PREPRIMARY SCHOOLS IN THARAKA NITHI COUNTY, KENYA.

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ABSTRACT

This study aims to establish if classroom arrangement is related to preschool learners' Performance in science activity areas. The study employed A descriptive research design. The target population for this study was 240 pre-schools, 505 teachers, and 5326 learners in the early childhood Classes (PP2) in the three sub-counties (Meru et al.) of Tharaka Nithi County. All the learners in PP2 classes and their class teachers were purposively sampled to participate in this study. The resultant sample was 36 preschools and 211 teachers. The instruments for data collection were questionnaires for teachers, documentary analysis, and an observation checklist for preschool children.

Descriptive analysis was applied to the data from the questionnaires. As for the Inferential statistics, the researcher tested the hypothesis using the Pearson correlation coefficient and linear regression to establish a relationship between the independent and dependent variables.

The study established that the classroom arrangement moderately influenced the learners' Performance in science activities. However, the mode of class arrangement was informed by the nature of the science topic being taught.

Key Words: Classroom Arrangement, Performance in Science, Preprimary schools

INTRODUCTION

There is a need for better science education in pre-primary schools to assist today's learners in developing new knowledge, reasoning abilities, and problem-solving skills required for the rapidly technological world (Johnson & Adams, 2011).

In Kenya, science is a key component of the pre-primary school curriculum. According to the Kenya Institute of Curriculum Development (KICD 2017), the general objectives of science at the pre-primary level are to develop children's curiosity, create opportunities for them to observe, hypothesize, experiment, and report or record findings as well and help them to develop problem-solving skills and acquiring science concept such

as measuring, weighing, speed, floating and sinking and solubility.

The physical arrangement of the class usually influences the classroom learning process. Teachers and administrators must use classroom furniture arrangements (Simmons, Carpenter, Crenshaw, & Hinton, 2015). Gremmen, van den Berg, Segers, and Cillessen (2016) explained that having a well-organized classroom can result in positive behavior and interaction among the teacher and learners, likely decreasing behavior problems within the classroom. The classrooms should be arranged appropriately for effective Instruction, thus forming a component of instructional management. Teacher coordination in classrooms includes activities like advising the learners, answering the questions the learners ask, and reacting to what the learners are doing in classrooms.

This affects the teacher's popularity and appeal amongst learners. Thus, teachers should be attentive to every learner and glance at all the learners in the classroom without discriminating against them (Prichard & Moore, 2016). The teachers create negative or positive interactions between him/herself and their learners. Communication can be done positively when the learners are keenly involved in their learning activities in the classroom.

RESEARCH QUESTION/ HYPOTHESIS

The study was based on the following objective:

i. To determine how classroom arrangement relates to children's performance in preprimary science.

The study also tested the following null hypothesis at a significance level of 0.05

H_{01}: Classroom arrangement has no statistically significant relationship with children's science performance in preprimary schools.

REVIEW OF RELATED LITERATURE

Classroom arrangement has significance in the learner's outcomes and overall performance (Han et al., 2018). As an agent of logical stimulation, a favorable environment in the classroom is a vital factor that influences a child's education level. This increases the importance of the study of classroom arrangement and how it affects science instruction. The classroom's physical set-up is very significant to the learners because it forms the first glance that the learners see when they get into the class. Unorganized bookshelves, random learners' desk patterns, and excess classroom clutter can hurt the learner's perception of the classroom and learning (Acar, 2014).

An unkempt and disorderly classroom portrays a bad picture of the teacher. Messy classrooms bring a sense of teacher instability. A tidy and well-spaced classroom is essential in learning, especially in sciences, where observation forms a part of learning. How the classroom arrangement has impacted the learner's Performance in sciences

in Tharaka Nithi County preschools is yet to be explored, and this is what this research seeks to establish. Classroom arrangement forms a part of Instructional management, as it influences the teacher's Instruction and the learning process in the classroom (Udvari-Solner & Thousand, 2018). Therefore, This study aims to establish how classroom arrangement relates to children's Performance in science activities.

Besides classroom arrangement influencing learners' behaviour, it has been hypothesized to impact achievement (Cheryan et al., 2019). However, to date, no studies have empirically investigated how the more common seating arrangements directly influence cognitive processes in school-age children. An exception is a study by Keller and Takács (2019) that analyzed the effect of row versus cluster seating arrangements on the quantity and quality of the work produced in reading, language, and mathematics in primary school children. They found that the quantity of work completed increased when children were seated in rows, while the quality of work was maintained. To date and to the best of our knowledge, this is the only study that has experimentally investigated this issue.

Research suggests that the set-up of the classroom space shapes instructor pedagogy, choice of activities, and on-task learner behaviour. For example, a classroom with seating affixed and directed toward a podium at the front of the room results in instructors spending more time in lectures and learners demonstrating less active engagement. In contrast, roundtable seating arrangements lead to instructors and learners engaging in more active learning activities, resulting in improved learning outcomes (Brooks, 2012). Further studies demonstrate that learners prefer more flexible seating arrangements (Harvey & Kenyon, 2013). In particular, learners express a preference for classrooms with mobile vs. fixed chairs and trapezoidal tables with chairs on casters vs. rectangular tables with immobile chairs.

Pekarek, Doehler, and Eskildsen (2022) asserted that the ability of the teachers to arrange and organize the learning materials inside the classroom influenced the learner's ability to understand the concepts. Visible learning resources contributed immensely to the process of learning, especially science and related subjects. Eskildsen (2018) found that specific behaviors played a part in learners not receiving adequate Instruction and that their attention to Instruction was increased when the seating arrangement was appropriate for teaching.

However, a study done by Keller, Davidesco, and Tanner (2020) found an increase in off-task behavior when using the row seating arrangement in a fifth-grade class. Keller et al. (1985) also acknowledged that row seating could have been a more favorable arrangement to improve learner off-task behaviors and found it to be the least effective. Keller et al. (1985) added that if teachers wanted to increase interaction between teachers and learners, row seating differed from the arrangement to accommodate learners' needs.

METHODOLOGY

A descriptive Survey research design was used for this study. A descriptive research design was applied as the researcher collected data from the preschools, using the situation as it is and without the manipulation of the variables. The target population for this study was 240 pre-schools, 505 teachers, and 5326 learners in the early childhood Classes (PP2) in the three sub-counties (Meru et al.) of Tharaka Nithi County. The researcher used stratified random sampling to ensure that particular respondents who possess data that the researcher required are included in the sample. The sub-counties in Tharaka Nithi County were used to form the sampling strata. A sample of 15% of the pre-schools in each of the sub-counties was sampled using stratified sampling, thus resulting in 36 preschools.

The researcher obtained a list of preschools from the sub-county educational office, which served as a sampling frame. The researcher then randomly selected 15% of the schools in the list by assigning an identifying number to each of the schools and then selecting 13 numbers for Meru South, 11 for Maara, and 12 for Tharaka randomly and picking the schools identified by the selected numbers. The teachers and the learners in the sampled schools were sampled for this study. By this, all the learners in PP2 classes and their class teachers were purposively sampled to participate in this study. The resultant sample was 36 preschools and 211 teachers.

The instruments for data collection were questionnaires for teachers, documentary analysis, and an observation checklist for preschool children. Descriptive analysis was applied to the data from the questionnaires. These included: frequencies and percentages. The results of the data analysis were presented using tables. Data from the documentary analysis was tallied, and class averages were computed from the teachers' learners' ratings, indicating the study's dependent variable. As for the Inferential statistics, the researcher tested the hypothesis using the Pearson correlation coefficient and linear regression to establish a relationship between the independent and dependent variables.

This is because this study had a measurable dependent variable and categorical independent variable, thus making the test the most appropriate method of inferential analysis. Significance was tested at 0.05 level of significance at 1 degree of freedom. If the p-values are lower than 0.05 significance level, the null hypothesis is rejected; on the contrary, if the significance level is more significant than 0.05, then the null hypothesis is accepted. The quantitative data was discussed to form the conclusions of the study, while the qualitative data was used to reinforce the findings obtained from the quantitative data.

RESULTS AND DISCUSSION

In the study, 77.8% of the teachers were female, while 22.2% were males, a typical representation of female teachers grossly outnumbering male teachers.

On qualifications, the study established that 30.6% of preprimary school teachers had a diploma level of qualification, 19.4% had attained a bachelor's degree in ECE education, 16.7% had a certificate level of qualification and another 16.7% had a P1 level of qualification as summarized in Table 2.

All the teachers' involved in this study had a relevant teacher certification as shown in Table 2.

Table 2. Teachers' Academic Qualifications

Qualification	Frequency	Percentage
Degree (ECE)	35	19.4
Degree (Education)	15	8.3
ECE certificate	30	16.7
ECE diploma	55	30.6
Education Diploma	15	8.3
P1	30	16.7
Total	180	100

Only about a quarter of the teachers (27.7%) reported having a diploma or an education degree. On the length of service of teachers, about one-third of the teachers had served beyond ten years in the schools, while a majority (63.9%) had served only up to ten years, as presented in Table 2

Table 2: Length of Service as a Teacher

Time	**Frequency**	**Percentage**
Below five years	20	11.1
5 to10 years	95	52.8
10 to 15 years	40	22.2
15 to 20 years	20	11.1
20 years and above	5	2.8
Total	**180**	**100**

These findings reveal that most (88.9%) of the teachers had taught for more than five years.

The findings from documentary analysis of the means of the results from the preschool learners' science assessment tests are presented in Table 3.

Table 3. Descriptive Statistics of the Preschool learner's science assessment scores

Range (Scores)	**Frequency**	**Percentage**
0-49 (Below Expectation)	9	5
50-64 (Approaching Expectation)	23	12.8
65-79 (Meeting Expectations)	44	24.4
80-100 (Exceeding Expectations)	104	57.8
Total	**180**	**100.0**

The findings from the preschool learners' science assessment tests imply that the majority (57.8%) of the preschool classes had learners scoring a mean of (81-100) in their science assessment tests, which implies that they exceeded the expectations in their assessment. This implies that their preschool learners' science assessment was above average, which is good. However, there was a challenge with the schools with learners' means that scored low (below 50) on science assessment, as the test revealed.

The study further sought to establish children's performance in science of the learners. The findings obtained from documentary analysis of the means of the results from the preschool learners' science assessment tests are presented in Table 4.

Table 4: Children's performance in science

N Valid	180
Mean	79.2641
Median	80.2441
Mode	78.26
Std. Deviation	5.56324
Variance	44.21007
Minimum	44.00
Maximum	96.00

Table 4 shows that the lowest score was 44, and the highest was 96. The mean of children's performance in science scores was 79.2641 with a standard deviation of 5.56324. About 50% of the subjects had scored above the mean. This implies that the learners scored high on children's performance in science tests, where most of the scores were below 80%. The learners who scored below 70% on the preschool learner's science assessment test score imply that there was a challenge in the learners' children's performance in science. Thus, this study aims to establish how classroom management practices influence it.

Classroom Arrangement and the Performance of Children in Science

The study sought to establish the relationship between classroom arrangement and children's Performance in science. The respondents were required to indicate their level of agreement on a 5-point Likert scale where S.A= Strongly Agree, A=Agree, U = Undecided, D=Disagree, S.D=Strongly Disagree. The findings obtained are presented in Table 5.

Table 5. Classroom Arrangement and the Performance of Children in Science

Statements	SA	A	U	D	SD	Mean
In the classroom, the learner's seating arrangements affect the levels of knowledge acquisition and Performance	13.8	58.4	5.6	16.6	5.6	3.587
Learners' arrangement in the classrooms is made in the form of groups that have different cognitive abilities for ease of Instruction	16.7	61.1	2.8	5.6	13.9	3.614
The learners with visual problems are always considered when arranging the classrooms to improve their chances of learning	63.9	30.6	0	2.8	2.8	4.503
The teacher alters the classroom arrangement according to the subject the learners are learning and the topic they are being taught to ease the process of Instruction	11.1	66.7	8.3	8.3	11.1	3.749
The teachers always ensure that the learners remain in an orderly state throughout the lessons	27.8	58.3	2.8	8.3	2.8	4.000
The science instructional materials are well	64.3	19.5	2.8	8.3	5.3	4.298

displayed at strategic locations in the classrooms for ease of access by the learners						
When the classroom is well arranged, the learning of science goes on smoothly, without interruptions	11.1	58.3	2.8	13.9	13.9	3.388

A Mean score range from 3.4 0 to 5.00 means that the respondents agreed with the statement while a mean ranging from 1.00 to 2.59 is interpreted that the respondents disagreed with the statement. The study established that the majority (58.4%) of teachers believed that learners' seating arrangement in the classroom affects the level of children performance in science. These findings agree with the sentiments of Han, Kiatkawsin, Kim, and Hong (2018), who stated that classroom arrangement significantly impacts learners' outcomes and overall performance. As an agent of logical stimulation, the favorable environment in the classroom is a vital factor that influences a child's performance level.

Learners' arrangement in the classrooms was done in groups of different cognitive ability for ease of instruction, as was revealed by 61.1% of the respondents who agreed, and a mean of 3.614 for the statement. More recent research suggests that the set-up of the classroom space shapes instructor pedagogy, choice of activities, and on-task learner behavior.

For example, a classroom with seating affixed and directed toward a podium at the front of the room results in instructors spending more time in lectures and learners demonstrating less active engagement. In contrast, roundtable seating arrangements lead to instructors and learners engaging in more active learning activities, resulting in improved learning outcomes (Brooks, 2012).

Learners with visual problems were considered when arranging the classrooms, to improve their opportunity for learning, as was indicated by 93.9% of the respondents who agreed, with the statement (mean = 4.503?. To successfully deliver classroom curriculums, promote learner growth, and meet the goals of all learners served within early childhood settings, teachers must have a basic understanding of the unique learning needs of all learners, including those with disabilities. Early childhood educators who have received training in special education topics are generally more positive about inclusion than those who enter the teaching field with a limited knowledge of special education (Willingham, 2021).

The findings further revealed that the teacher alters the classroom arrangement according to the subject the learners are learning, and the topic they are being taught to ease the process of Instruction, as was indicated by 66.7% of the respondents who agreed, and a weighted average of 3.749 was obtained. These findings agree with the sentiments of Fernandes, Huang, and Rinaldo (2011), who claimed that the physical configuration of a classroom is more than an organizational or stylistic choice by the instructor.

The study also established that the teachers always ensured that the learners remained orderly throughout the lessons, as indicated by 58.3% of the respondents who agreed, and a weighted average of 4.000 was obtained. These findings agree with the findings of Acar (2014), who stated that unorganized bookshelves, random learners' desk patterns, and excess clutter in the classroom could hurt the learner's perception of the classroom and learning at large. An unkempt and disorderly classroom portrays a bad picture of the teacher. Messy classrooms bring a sense of teacher instability. A tidy and well-spaced classroom is essential in learning, especially in sciences, where observation forms a part of learning.

The study's findings revealed that the majority (64.3%) of the respondents strongly agreed that the science instructional materials are well displayed at strategic classroom locations for learners to have easy access. The findings are further supported by a weighted average of 4.298 that was obtained. A study carried out in Hong Kong on the classroom environment showed that the science learning corners and the bookshelves were placed at the sides of the classroom. In contrast, the learner's desks and lockers were conveniently placed in the middle of the classroom to manage the spaces (Cabell et al., 2015). Teachers in the study also agreed (58.3%) that the classroom is well arranged, science learning goes smoothly, without interruptions (Mean =3.388).

Table 6: Classroom Arrangement and the Performance of Children in Science

Variables	Rating of Teacher Effectiveness in Classroom Arrangement				
	VP 1	P 2	A 3	G 4	VG 5
Seating Arrangement					
By row arrangement	0	0	0	22.2	8.3
Conference (circle) arrangement	0	0	0	16.7	13.9
U-shaped arrangement	0	0	0	5.6	33.3
Class Order/Disorder					
Desk's arrangement	0	0	16.7	11.1	72.2
Location of learning charts	13.9	16.7	5.6	19.4	44.4
Lighting of the classroom	5.6	11.1	25	41.7	16.7
Spacing in the Classroom					
Ease of movement	11.1	16.7	5.6	22.2	44.4
Number of learners in the classroom	5.6	8.3	27.8	52.8	8.3
The physical size of the classroom	5.6	11.1	13.9	55.6	13.9

Key : P = Poor, G = Good.

Classes were seen to adopt three main seating arrangements; 31.0% of the classrooms were arranged by row arrangement, 31.6% had conference circle arrangements, and 37.4% had a U-shaped arrangement. The physical arrangement of the class was seen to affect the classroom learning process. Teachers and administrators must use classroom furniture arrangements which is in agreement with Simmons et al., 2015.

On class order, it was observed that the majority (72.2%) of the teachers were very good at arranging and organising desks in the classrooms. Having a well-organised classroom can result in positive behaviour and interaction among the teacher and learners, which more than likely will decrease the occurrences of behaviour problems

within the classroom Mudianingrum, Evenddy, and Rima (2019). On seating arrangement and its impact on learner behaviour, Slavin (2013) found that groups of desks helped learners socially but hindered their individual work performance.

The study further observed that 44.4% of the classrooms were very good at placing learning resources inside the classrooms. The concern was that 30.6% of the teachers needed more effective classroom teaching and learning materials placement. These findings agree with the findings of Pekarek, Doehler, and Eskildsen (2022), who asserted that the ability of the teachers to arrange and organize the learning materials inside the classroom influenced the learner's ability to understand the concepts.

Clearly, visible learning resources contributed immensely to the process of learning, especially science and related subjects. Eskildsen (2018) found that specific behaviours played a part in learners not receiving adequate Instruction and that their attention to Instruction was increased when the seating arrangement was appropriate for teaching.

The study further established that 41.7% of the learners' classrooms had adequate attention, whereas 11.1% of the classrooms did not have adequate attention. These findings agree with Prichard and Moore (2016), who stated that teachers should be attentive to every learner and look at all the learners in the classroom without discrimination. The teachers create negative or positive interactions between him/herself and their learners. Communication can be done positively when the learners are keenly involved in their learning activities in the classroom. However, a study done by Keller, Davidesco, and Tanner (2020) found an increase in off-task behavior when using the row seating arrangement in a fifth-grade class. Keller et al. (1985) also acknowledged that row seating could have been a more favorable arrangement to improve learner off-task behaviors and found it to be the least effective.

On spacing in the classrooms, the researcher established that 44.4% of the classrooms had adequate space to allow easy movement inside the classrooms. However, 11.1% need better spacing. In comparison, 16.7% of the classrooms did not allow easy movement, and this is a cause of safety concern.

Lang (2021) stated that the physical make-up of a class, such as furniture, room dimensions, and space provisions in the room, can influence a learrner's behavior. The study further established that on matters of number of learners in a classroom, 52.8% of the classes had the stipulated number of learners, while 8.3% were overcrowded. These findings agree with Cabell *et al*. (2015), who established that logically arranged classrooms improve student learning.

The hypothesis **H_{01}:** Classroom arrangement has no statistically significant relationship with children's science performance in preprimary schools, was analysed through One way ANOVA which yielded t=15.62, p=0.001 implying a significant relationship between classroom arrangement and class performance.

These findings are in line with the findings of a study carried out in Kenya by Wanjiku (2013), a presumed organization in the classrooms that encouraged learners' academic performance, practical teaching and learning, and teacher efficacy. Science learning requires a lot of concentration by the learner. A well-organized classroom (in terms of seating arrangements, schedules, and activities) enhances the learner's concentration, reduces disruptions, and thus improves the learner's achievement in science.

CONCLUSION

This study established that the classroom arrangement moderately influenced the learners' Performance in science activities. However, the mode of class arrangement was informed by the nature of the science topic that was being taught. It is recommended that school management strives to keep class size within the specifications stipulated by the Ministry of Education.

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